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Research Article

New Spacer Design And Review On Existing Spacer Designs Used In Complete Denture Fabrication

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ABSTRACT

The impression-taking process used to create a complete denture prosthesis is one of the major variables impacting the treatment's result. The selective-pressure technique is the most widely acknowledged of the several impression philosophies that have been put out over time by various authors. In this method, stresses are directed judiciously to biomechanically sound tissues while vulnerable tissues are eased utilizing custom trays with spacers of various materials and designs.But because many Dentists are unaware of the ideal material for making custom impression trays, adequate extension, necessary thickness and spacer designs, tissue stops, escape holes, tray handles, and polymerization time for custom impression trays in prosthodontics, dentists frequently use stock trays for both the primary and final impressions. In light of diverse clinical scenarios in their practice, this article will provide dentists with a comprehensive understanding of how to employ precise spacer design, material, and thickness, tissue stops, and escape holes.

INTRODUCTION:

Making a precise impression is essential to prosthodontic practice. The dental professionals must carefully evaluate the tissues to be captured in the imprint, the type of impression trays, the impression material, and the treatments to be applied as a result of this. We came to the conclusion that stock metal trays are the most widely utilized imprint trays after having numerous informal conversations with academics, practitioners, and lab workers. Few of them are aware of how stock trays can be modified to be more exact. Very few doctors take impressions in partly edentulous arches using custom impression trays.Stock trays are typically used in detachable prosthodontics to create the initial and final impressions. The chosen stock tray must completely and excessively cover the denture-bearing surface. The option to use any spacer design with tissue stops inside the custom impression tray is provided by a primary cast that adequately covers the planned denture bearing area, dictating impression technique and enabling superior final impressions.Even though complete dentures are made using custom impression trays, most doctors rely on lab workers to create the trays because they lack sufficient expertise about custom impression tray design. To transport, manage, and contain the necessary impression material, a custom impression tray is needed. Because many primary impressions were inadequate for capturing the desired area of the mouth, many lab technicians felt the need to change the primary cast before building bespoke impression trays.(1,2)

Complete denture impressions have been made from the time when wood or ivory blocks were cut to fit the intraoral features. Because of a detailed understanding of the oral tissues, their behavior, and their response to manipulation for producing impressions, more sophisticated procedures are currently used. A precise impression must be taken in order to perform prosthodontic procedures. Dental clinicians must carefully evaluate the tissues to be captured in the imprints, the type of impression trays, the impression materials, and the techniques to be applied as a result of this(3). Mucostatic, Muco compressive, minimal pressure, and selective-pressure impressions are the four main impression-making philosophies that have been offered over time.

1.The mucostatic impression technique (1938) uses easily flowing material, like as impression plaster, to capture denture-bearing tissues in a static, undisturbed form. The denture will have poor retention, stability, and cosmetic look as a result of insufficient coverage of the denture-bearing area.
2.In order to guarantee stability for dentures while they are in use, Muco compressive impression technique records the tissues in their functional shape. This method is not very promising because it will result in constant pressure, which will cause residual ridge resorption. Additionally, because the displaced tissue during function tends to recover during rest, it will affect denture retention.
3.A middle ground between mucostatic and Muco compressive approaches is the minimal-pressure technique. In this method, denture-bearing tissues are recorded with the least amount of pressure—roughly no more than the weight of free-flowing material—possible. This technique's limitation is the absence of a regulated methodology for the amount of pressure to be used when making an impression.
4.The concept of selective pressure impression combines the Muco compressive and minimum pressure philosophies. Knowing the stress-bearing and relief locations has a direct impact on the spacer design for selective pressure. The mid palatine raphe and the incisive papilla act as stress-relieving structures in the maxillary arch, while the horizontal plates of the palatine bone act as stress-bearing structures. The buccal shelf area and the crest of the alveolar ridge on the mandible serve as the main stress-bearing and releasing zones, respectively.The primary impression can be scraped in specific places to apply selective pressure, or a special tray can be made with the right spacer design and escape holes (relief). Due to the precision with which we can accurately generate varying thickness in the impression material (due to changing thickness of wax spacer) and achieve variable compression of tissues at various regions, the latter is more trustworthy (selective pressure at selected areas). However, the opinions of many authors on how to create a selective-pressure impression vary. Although complete denture final impressions are made on custom impression trays, most doctors rely on lab workers to create them since there is a lack of expertise among physicians regarding custom impression tray design.
The selective-pressure impression technique is the most popular among the several impression theories that have been put out over the years. It incorporates Carl O. Boucher's proposed Muco compressive and minimal-pressure treatments' guiding concepts. The historical significance of all the aspects connected to physical, biologic, and behavioral regions as well as the period in which they were discussed and taught, as well as the process of making impressions for complete dentures, are all factors that should be thoroughly reviewed.(4,5)

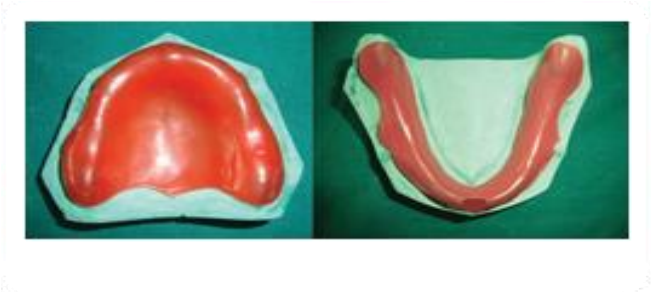
CLASSIFICATION OF SPACER DESIGNS:

1. Full spacers completely cover the remaining ridge, with the exception of the buccal shelf, retromylohyoid area, and PPS area in the maxilla. There is room for impression materials here.
2.Depending on the clinical scenario, partial spacers like the I-spacer and T-spacer cover particular tissues.
3. Windows of 2 mm wide are made at the canine and molar areas on either side of spacers with tissue plugs. Tissue stops will aid in the impression tray's proper vertical positioning and will assist you adjust the impression material's thickness.(6,7)

SPACER DESIGNS:

1.Boucher-

Advocated applying 1 mm base-plate wax to the whole basal seat area, with the exception of the posterior palatal seal (PPS) area, based on the selective-pressure technique. He claims that PPS will serve as a stopping point to guide the tray's placement throughout impression procedures. He also recommended drilling escape holes with a no. 6 round bur in the palatal region and covering the mandibular ridge with 1 mm thick base-plate wax, except the buccal shelf area and the retromolar pad.(1)



2. Morrow, Rudd, and Rhoads-

Advise using wax to block off any undercut regions and then adopting a full wax spacer that is 2 mm short of the resin special tray border all around. Then they suggest positioning three tissue stops (4 mm 4 mm) evenly spaced apart.(8)

3.Sharry-

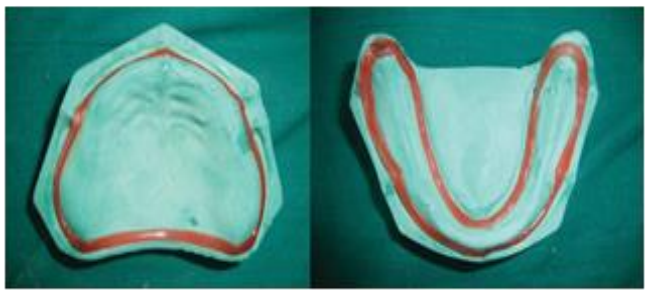
According to the minimal-pressure method, it is advised to apply base-plate wax to the entire tray area (even in PPS area). Before producing the final impression with the metallic oxide impression material, he advises placing four tissue stops (2 mm wide) in the molar and cuspid areas, which should reach from the palatal aspect of the ridge to the Muco buccal fold, and one vent hole in the location of the incisive papilla.(4)

4.Bernard-

According to the selective pressure technique, he suggests attaching a layer of pink base-plate wax (about 2 mm thick) to the parts of the cast that typically have softer tissues. He also suggests using wax spacers all around, with the exception of the posterior part of the palate, which he claims is at a high angle to occlusal forces. The exposed palatal region, which is not used as the mid palatine raphe and is not alleviated, serves as a stopper.(9)

5.Halperin-

Advised using the "custom tray" with side relief. He recommended that the PPS region and buccal slope regions of the custom trays be covered in 1 mm thick wax relief, and that the custom tray be in close contact with the basal seat areas. After border molding is finished, this gives the internal finish line that creates a butt junction of the compound to the tray. The tray surface and the border-molded portions serve as the final imprint surface, eliminating the need for a second wash impression. Without employing a wash impression, a master cast is poured directly into border-molded trays.(10)



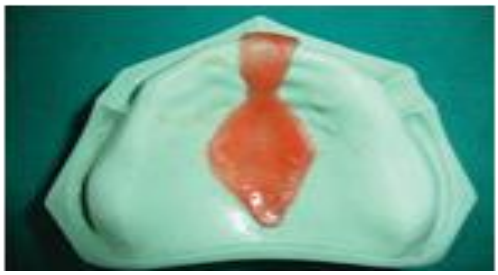
6.Mac Cregor-

It is advised to place a sheet of metal foil in the vicinity of the incisive papilla and the mid-palatine raphe based on the selective pressure technique. Additionally, he claims that the buccal surface of the conspicuous tuberosities, areas of mucosal injury, and maxillary rugae may all need alleviation. He comes to the conclusion that the relief should not be applied to dentures on a regular basis.(11)

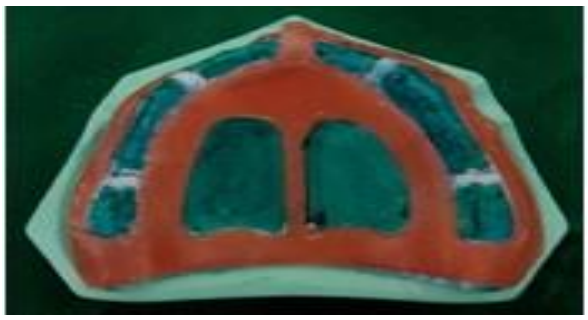
7.Neill-
Advises using 0.9 mm casing wax everywhere except for the PPS area.(12)

8.Heartwell-
Two techniques for applying selective pressure for maxillary impressions are mentioned. In the first procedure, the borders are fine-tuned after the initial impression is made with an impression compound in a non perforated stock tray. Later, by scraping the impression compound, space is created in specific places. He suggests making a unique tray as the second technique (but did not mention about the wax spacer). Low-fusing compound is used for molding the border. Before making the secondary impression with zinc oxide eugenol (ZOE) paste, he advises drilling five relief holes on the palatal region (three in the rugae area and two in the glandular region).(13)

9.Sheldon-
Explains two methods. In the first method, a low-fusing modeling compound is used to create the main impression (Kerr white cake compound). With Kerr green stick compound, the borders are smoothed down. The operator then performs selective relief by scraping in the vicinity of the incisive papilla, rugae, and mid-palatal areas after being happy with the retention (Figure 8). He explains creating an alginate main imprint in the second procedure. The first cast is poured. Undercuts are omitted after cast contour analysis. He then suggests installing a spacer or pressure control (bud did not mention clearly about the wax spacer design).Based on the selective-pressure approach utilized on high arched palates, border molding is done with green stick compound before generating the secondary impression with ZOE paste.(14)



10.Shetty-
Presented a method in which all areas—aside from the PPS area, which must be compressed during the border-molding procedures—require the placement of a thin sheet of wax (0.4 mm main connector wax [Renfert, Germany]). On top of the already modified wax sheet, a 1.5 mm thick layer of modeling wax is put. Since the horizontal palate and the alveolar ridge are stress-bearing locations, the modeling wax is taken off there.(15)



11.Smith-

The mid palatine raphe and ridge are covered in 1 mm thick base-plate wax. Two tissue stops, one at the exposed hard palate and the other at the canine region, aid in the precise vertical positioning of the tray and regulate the thickness of the imprint material.(16)

12.Miscellaneous-

For maxilla:A 1 mm base-plate wax is applied over the basal area, excluding the right and left posterior hard palates, using a minimal-pressure approach. Four tissue stoppers serve as stoppers at the canine and molar regions, as well as the exposed portions. Rubber is the preferred material.

For mandible:A 1 mm thick base-plate wax is applied using the selective-pressure technique to the whole alveolar ridge, with the exception of the retromolar pad area. Each tissue stop is positioned bilaterally in the canine area. Uniform thickness of impression material is provided by complete tissue stop covering. The part that bears tension is the exposed retromolar pad.(17,18)

13.MV new spacer design-

It's a universal design with a thickness of one modeling wax accounting for 1.5mm.Tissue stops are provided on canine prominence, which ensures proper seating to custom tray. Windows are created on lateral slopes of hard palate and buccal shelf which is a primary stress bearing area of Maxilla and Mandible
respectively thus increasing the thickness of denture base in that area and in turn transferring more occlusal load on non/slow resorbing hard palate and buccal shelf. In cases of flabby ridges small 0.5mm relief wax can be added below the spacer. Overall the new spacer design seems adequate enough to record selective pressure impressions in a complete denture case.

Clinical situation	Impression material	Spacer design and thickness
Non Undercut ridges	1. Impression plaster 2. Zinc oxide eugenol	-2 mm spacer with tissue stops -0.5 mm spacer
Non Undercut and undercut ridges	1. Alginate 2.Elastomeric impression materials: a. Polysulfide b. Silicones	-3 mm spacer with tissue stops -1.5 mm spacer with tissue stops -3 mm spacer
Displaceable tissues	ZOE paste, impression plaster and various elastomers	Spacer design and thickness variable based on clinical situation

(19)

DISCUSSION:

For complete dentures, keeping track of the tissues that support the appliance is crucial for a number of reasons, including tissue health, denture retention, and function. Similar to the adage "Preservation of what Remains is more Important than Meticulous Replacement of What is Lost," complete denture impressions should be preserved. For secure, retentive prostheses that are in harmony with surrounding and underlying tissues, proper knowledge of the anatomy of denture-bearing areas and the use of a bespoke tray with an appropriate spacer design and its application during impression production are essential. Frank has demonstrated that an impression tray with relief room and escape holes will experience the least displacement.(20)

CONCLUSION:

Dentists frequently and affordably take impressions using custom impression trays. Since the manufacturer has made all of these impression materials accurate and stable, the misfit of prostheses is never the result of the impression material. Instead, failure of the prosthesis is always the result of a variety of factors, including improper stock tray selection, improper pouring and handling of the impression materials, and improper technique used for making impressions and casting. If the dentist follows the processes exactly, a precise master cast and final prosthesis can be created utilizing the traditional impression technique. To provide a precise replication of the impression detail created using various impression procedures, a custom impression tray should be produced with the appropriate extension, unique spacer design, tissue stops, escape holes, tray handles, and the requisite polymerization period. For precise border molding and final impressions on patients with microstomia, sectional custom impression trays are employed. Dental professionals should be inspired by this article to adopt the best custom impression tray design as part of their regular practice. As a result, they might start to reap the benefits of shorter chairside breaks, improved final prosthesis adaptation, and positive patient feedback.The precision of the impression is crucial to the success of complete dentures. To reduce the risk of soft tissue abuse and bone resorption, one should apply pressure selectively only in those places that can endure the forces of mastication when forming an impression. This overview demonstrates the variety of spacer designs that are available for use in various applications. For total denture therapy to be successful, the dentist must choose a spacer design based on the specific problem.

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